MEDIAEC Platform.
Digital Television for Education and Research

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Abstract

Continuous development of educational and research technologies lead to the necessity of implementing a television network dedicated to education and research activities. In this respect, there are technologies like video-conference and multimedia systems which offer accessible solutions. The present paper describes the infrastructure and the protocols for this kind of television and possible implications of it in educational and research activities initiated within Alexandru Ioan Cuza University of Iasi, Romania.

Keywords: Digital television, Education, Multimedia system

1 Television in Education

The necessity of information exchange, which is essential in different interest areas as education, business, and entertainment etc., leaded to inventions that were designed to facilitate this process and encouraged research regarding communication instruments. At the end of the 19th century communication through electricity was a challenge and besides the phone creator, there were inventors and scientists like Goldstein (in 1876), Bidwell (in 1881) and Nipkow (in 1884) who in the same period were designing the first elements of what in 20th century became an industry: television. Thus, starting with 9th of April 1927, when the first long-distance transmission of live images and voice was held, the television turned into a resourceful instrument for communication.

Education, as one of the main interests of humanity, has been highly advantaged by these inventions and in a very short time after their implementation, starting with first forms of educational television broadcasting (Cambre, 1987; Saettler, 2004), the distance education through television networks became an option for formal and non-formal education. Moreover, distance education through video, occurring between teachers and learners who were separated by space or time, gained popularity (Moore, 1997). Over the last decades, while the Internet services were continuously improved, distance education through web video services started to replace distance education through cable television (Reisslein et al., 2005, p. 25).

Despite the advantages brought by educational television, especially for distance education services, there are researchers claiming that television might undermine the important role that pedagogical methods (Roberts and Herrington, 2005) have in teaching, by diminishing their usage or by totally replacing them. Yet, combined with face to face courses or other interactive activities, educational television might be considered as a pedagogical method itself. This concern might be also excluded, by considering the perspective of active/reactive theory (Anderson and Lorch, 1983) arguing that the learner interacts both with the information and with the viewing environment. Technology development made possible the use of three settings for distance education through video (Reisslein et al., 2005, p. 26):

- interactive two-way video and audio, which corresponds essentially to a video conference;
- one-way live video and two-way audio;
- one-way delayed audio and video.

Given the advantages of visualising and hearing the course contents along with explanations regarding them, distance education through video became widely spread in academic education. In this respect, proper settings and a balance between video, printed and live delivered content in education was required (Papagiannidis et al., 2006; Reisslein et al., 2005, Wiecha et al., 2003; Jesshope and Liu, 2001).

Moreover, when discussing about settings, a very important aspect in educational television is the cost implied in delivering all its services, starting with the equipment, infrastructure and delivery channels. The continuous development of technology offers the opportunity of designing infrastructures for television, which will not involve high costs and efforts. For example, a basic television scheme for Internet television (ITv) might function very well with a powerful computer, a server and a good Internet connection.

In the close future, the new Internet Protocol IPv6 using automatic configuration, will grant access to Internet for more than 4 billion computers, as IPv4 offers at the moment. This will imply no efforts for potential beneficiaries of Internet television in setting up their systems. Although this is an obvious advantage, with the infrastructure of the Internet networks nowadays, it is not possible yet to offer television services for millions of people at once, like in case of television through satellite; all because of the limitation determined by hardware infrastructure (Papagiannidis, Berry, and Li, 2006, p.516). It is not the case to be concerned by this limitation for an in campus television with few thousands of end users.

Considering this aspect and the performant equipment of the multidisciplinary platform for training and research MEDIAEC, we intend to implement a television for education and research in the campus of Alexandru Ioan Cuza University of Ia□i (UAIC), Romania.

2 Educational Television and Its Forms

Studies regarding television phenomenon and its influence in education have started in ‘70s and gradually, narrowed on researching television networks specialised for distance education. From these approaches we were interested in identifying how educational televisions and their framework were implemented, whether they were made from scratch or redesigned based on previous research results.

One of the well known distance education providers, Open University (OU) funded by UK Government has as target group adults, especially those willing to get a higher degree but don’t have enough time to enrol in a university and attend daily courses. Educational television, as a method in distance learning used by Open University programs, was introduced in 1971 when their first course was broadcasted. This initiative was possible by using the infrastructure - terrestrial television - and the support of British Broadcasting Corporation (BBC) which included OU courses in their programs grid. Nowadays, OU extended its strategy for course delivery and offers support for their students by digitalising most of its services and using Internet protocols. Local tutors are available to offer feedback and support to the students through e-mail, telephone, video-conferences and even face to face. An entire platform (Open2.net) is dedicated for sharing materials, discussions, online teaching and assessment sessions. Thus, the broadcasted courses are completed by a continuous interaction facilitated by Internet, other communication instruments and face-to-face meetings.

In America, during early ‘60s along with the increasing number of television networks, the idea of educational television caught specialists’ high interest. Aiming to provide educational

programs across America, the Educational Television and Radio Center (ETRC) was founded in 1952. The educational programs were distributed between television stations across America, and were actually produced by them, not by ETRC. Along with the dynamic change of its name and status, ETRC started to distribute educational programs produced by BBC and varied the number of covered subjects. The American educational television used in classrooms or course halls was at its height in '60s, declined in '70s and begun to be used again in '80s (Saettler, 2004).

The concept of educational television was included by the concept of television itself but later, it started to clearly delineate and address to certain target groups: children, adults or furthermore, to primary school or secondary school children, to students or to teachers etc. For example, in Australia, in 1992, a program for teacher's professional development was initiated (Evans et al., 2001). The courses within this program were provided via satellite transmission aiming to support interactive television with one-way transmission and live telephone link or delayed fax as interactive strategy. SOFTNet, as the system was named, consisted of equipment installed in schools from country side, with satellite receiving dish, decoder and wiring to a room. The responsible with these programs extended SOFTNet usage to the phase of support for curriculum areas and for internal communication encouraged by the lowering costs in teacher's professional development. All because of television's role in facilitating information transmission.

A different concept of educational television system is the one locally implemented in a university or any other educational institution. An example of this kind of television is the one experimentally designed to broadcast between two student campuses from Massey University, New Zeeland (Jesshope and Liu, 2001). It consisted of an Asynchronous Transfer Mode (ATM) network with a bi-directional link, meaning that the professor had whether audio or video feedback from the remote class (Jesshope and Liu, 2001, p.11). Using motion JPEG standard, the video was compressed by hardware and transmitted through the network which had 10-20 Mbits per second bandwidth. Although the video materials were successfully transmitted, this type of network and the encoding procedures have proved to be inefficient for high quality presentation graphics. As a solution to these inconveniences was the introduction of MPEG standard encoder which permitted a high quality transmission using a small transfer rate.

These examples, briefly described above, highlighted the tendency of education providers to focus educational television services on certain target groups and improve its strategies and contents in order to increase the quality of education. Thus, as a strategy of improving the quality of UAIC's educational programs, we propose as an additional method in teaching and learning, an educational television within UAIC campus. This television will address to all students, professors and university's staff, whether in campus or in any other location.

3 Digital educational television within UAIC

MEDIAEC platform was designed to develop research and educational services through interdisciplinary, multifunctional and permanent interaction. Its main objective is to implement the technology's benefits in teaching and learning activities as well as in research, to stimulate the creative potential of the academic staff and students, to support collaboration between research networks in Europe and around the world.

3.1 MEDIAEC Infrastructure

In the section below we will describe the infrastructure and the potential MEDIAEC has, in supporting a digital educational television in and out of UAIC campus. There are eleven fully equipped video-conference rooms in three buildings of the university. Students or professors from any faculty in UAIC can dispose of these rooms in order to transmit or receive live courses in campus or worldwide, as it can be seen in *Figure 7*. The infrastructure of MEDIAEC platform

allows this kind of activities and supports high quality image transmission in and out UAIC's network, making possible interactive teaching and learning situations.

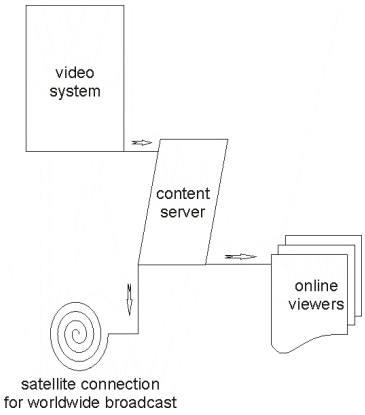

Figure 7. Video Broadcasting Inside and Outside UAIC Campus

The video system from the video-conference rooms and the content server are communicating through university's wide area network (WAN) using TCP/IP protocol.

The viewers connected to the system can watch live transmissions using whether HTTP, UDP or TCP, directly on their computers, in any location from inside or outside the university campus. They must fulfil a minimum software requirement: an installation of Media Player, Real Player or Quicktime Player. Also, through MEDIAEC platform we are able to transmit video and audio content by satellite, making possible a worldwide broadcast. These two aspects might represent a big advantage for the students enrolled in UAIC's distance learning programs, by offering them the possibility to participate at certain courses along with other students. In case the transmission is interrupted or the students cannot connect to watch live transmitted courses, the recordings made, can be downloaded anytime. The video recorder server within the video system, as represented in *Figure* 8, makes possible recordings and data storage.

The recording feature can be used during discussion sessions, tutorials, projects or research meetings, in order to make an archive which can be consulted anytime when is needed, directly from MEDIAEC servers, without using other data storage devices.

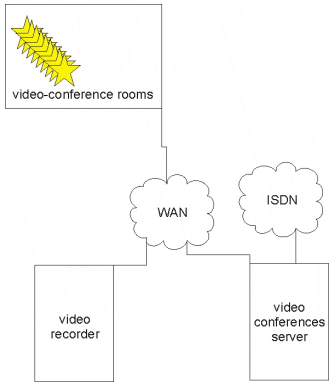

Figure 8. Video System Servers and Its Connections

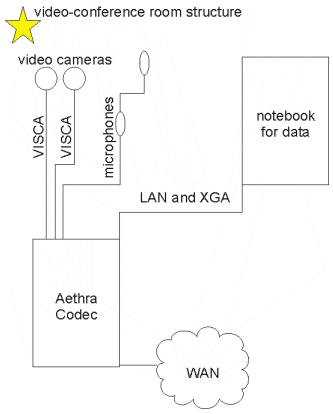

Figure 9. Video-conference Room Structure

The functionality of a video-conference room is assured by two video-cameras, microphones, a notebook for data and the AETHRA codec with the following video standards: H261, H263, H263+, H263++, H264 (see *Figure* 9). The audio and video information from video-cameras, microphones and a notebook are captured by AETHRA, coded using H323 or SIP protocol, transmitted through UAIC's WAN to MEDIAEC servers and/or to any compatible codec

outside the institution or to personal working stations with compatible specialised communication software.

Additionally to the system described above, MEDIAEC disposes of a mobile video-conference system - TANBERG and a mobile video camera - which has two possibilities of connection and transmission: through cable or directly to the satellite. Thus, the transmissions might be made from any other location outside the UAIC campus.

As already mentioned the system supports two-way audio and video interaction, between video-conference participants, combined with the alternative of presenting high-quality images or live desktop captures which influences the quality of communication and decreases the barriers that might appear in distance learning situations.

3.2 A Digital Television Project for UAIC

Considering the advantages offered by this high-technology infrastructure, the plan of initiating and implementing a Digital Educational Television - with MEDIAEC's support - for students and academic staff in UAIC, is achievable.

Before implementing a full programs grid for digital educational television in our university, an initial evaluation of students' needs and new technologies usage within campus, is needed. UAIC offers courses to a number of 38.000 students from 15 faculties. The communication infrastructure already existent within university represents an advantage in the process of implementing the digital educational television. For example, each faculty has at least one laboratory connected to Internet and students have unlimited Internet access in the accommodation campuses.

An initial evaluation regarding academic staff needs regarding the information which might be offered through educational television programs is also needed. Thus, when designing the full grid of educational programs within our university, the responsible team has to consider the balance between:

- educational and research topics covered by the broadcasted materials
- students and academic staff needs on educational television
- each faculty's strategy and number of students

As in other universities or training organisations, the television programs might be transmitted live with the possibility of recording or directing and recording the material by a specialised staff and finally, broadcasted for UAIC students and academic staff. This second option requires a professional team for preparing and recording this kind of programs but the professional team might be replaced with especially trained teams in each faculty, teams able to direct and prepare materials for a certain number of programs. Although this seems to be a complicated procedure, it might be an opportunity to actively involve students in preparing video-materials for educational television.

The advantage offered by an in-campus television is that students from different faculties can watch recorded courses/programs from other faculties, without finding themselves in the situation to skip their mandatory activities from the daily schedule, in order to assist to other courses. Also, an educational television might be considered a real support during special events hosted by UAIC (conferences, public presentations etc.) when the amphitheatres or conference rooms might be too small for the audience or when parallel sessions are ongoing. For example, by transmitting live and recording a conference activity, the organisers offer the opportunity for their target group to "participate" to all sessions and get the information presented. The activities of "3rd International Conference on Adult Education" - organised by UAIC - were broadcasted and recorded for further access on MEDIAEC servers, using both video-conference systems, including the mobile one.

The two-way audio and video communication settings offered by MEDIAEC platform, allows the system to broadcast courses held by professors from other universities/institutions from

Romania or from any other country around the world. In this case, the presenters or speakers from other institutions need to have a minimal hardware equipment and software which supports audio and video conference (camera, microphone, Skype) or a specialised conference system.

Regarding the role of educational television in research, there are at least two ways of using MEDIAEC platform in order to develop research strategies:

- as instrument for disseminating research results from different areas;
- as an instrument during studies regarding educational television, digital television and its influence in teaching and learning.

An advantage which must not be omitted is that an educational television in UAIC, might be efficient in broadcasting administrative news on monitors placed in public location, in order to reach interested audience.

Considering all the possibilities that a digital educational television could bring, and our objective of improving the quality of educational services, it is useful to think about it as a complementary method for teaching and learning, not a replacement for formal courses or tutorials. Also, it might be considered as an additional instrument for information sharing along other new technology components.

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